Introduction

Attention deficit/hyperactivity disorder (ADHD) is a common problem among children accounting for 50% of those attending to child psychiatry clinics. The symptoms of this disorder include attention deficit, hyperactivity, and impulsivity that result in numerous problems at home, school, and social conditions leading to dysfunction in individual and family life of the patients. The prevalence of ADHD in school-age children was reported to be 5.2% and there is no significant difference in the prevalence in different geographic regions.

It is seen that more than 50% of ADHD patients suffer from psychiatric comorbidities and this problem is often continued to adulthood ages. Review of the current literature shows that about 36% to 40% of ADHD subjects have oppositional defiant disorder, 10% to 11% conduct disorder, 4% to 21% depression, and 15% to 25% have anxiety.

There is compelling evidence that ADHD comorbidities would affect the presentation and clinical severity, long-term prognosis, and therapeutic response of disease. For example, in presence of communicative disorder concomitant with ADHD, this comorbidity would deteriorate the ADHD symptoms and increase aggressive behaviors and anxiety and result in lack of intimate relationships. Also, some studies have shown that anxiety comorbidity in ADHD patients is a cause of poor therapeutic response to psycho-stimulant medications.

The psychiatric studies are affected by geographic conditions and research methods. Of these, using diagnostic instruments may originate some controversies about the results of the studies on ADHD psychiatric comorbidities. Other factors affecting the related studies include the findings regarding current or lifespan ADHD comorbidities, as well as selected sample population. For example; some studies have used the clinical or specific samples. It seems that the implementation of more individual diagnostic tools among ADHD patients and recruitment from general populations at large would lead to more congruent results.

This study was performed to determine the lifetime prevalence of psychiatric disorders concomitant with ADHD among primary school students in Iran.

Subjects and Methods

This was a descriptive-analytical study. One hundred thousand four hundred eleven primary school students (51189 males and
of the city were participated in the study in 2010. Two-stage cluster sampling method was used to select the subjects. Therefore, three male and three female schools were selected randomly from each district. Then, two classes from each school were chosen and all the included students were studied. In total, 1658 students (781 girls and 877 boys) from 60 classes were selected. Teachers were asked to assess the ADHD symptoms by completing Conners’ Teacher Rating Scale (CTRS) and the ADHD Rating Scale. The 216 students who screened were interviewed by a child and adolescent psychiatrist according to DSM-IV-TR diagnostic criteria and ultimately 160 children were diagnosed as ADHD. Then, both children with ADHD and their parents underwent K-SADS-PL semi-structured diagnostic interview for diagnosis of psychiatric comorbidities.

Diagnostic tools
Conners’ Teacher Rating Scale (CTRS)
The revised CTRS includes 28 items to diagnose the core symptoms of ADHD and some co-morbidities such as oppositional defiant disorder in the age range of three to 17 years. Answers were scored based on a four-scale Likert method. The scale is available in parents, teacher, and adults’ self-report forms. The revised CTRS has a good sensitivity and specificity. The obtained results from this scale are valid as reported by Dereboy and its internal validity is shown to be more than 0.90.
The ADHD-RS includes 18 items that each shows one ADHD symptom according to DSM-IV-TR criteria. It may be used for age range of five to 18 years and is useful for differentiation of ADHD and healthy children and differentiates attention deficit symptoms from hyperactivity and impulsivity symptoms. It was used to differentiate various types of ADHD in this study. The validity of English version of ADHD-RS is approved. The ADHD-RS-IV has been used extensively in Iran and offers valid measurement of attention and behavioral problems in school-age children.

The reliability of ADHD-RS was 0.81 using Cronbach’s alpha in this study. We used these two instruments for screening so as to increase accuracy and decrease the false negative or positive cases. For this, we recruited only the subjects who had the same positive results for ADHD based on CTRS and ADHD-RS simultaneously.

K-SADS-PL semi-structured diagnostic interview

This questionnaire is a semi-structured diagnostic interview designed according to DSM-IV criteria and is fulfilled via interview with parents and child by a psychiatrist. K-SADS-PL has a proper capability to diagnose mood, anxiety, behavioral, and other psychiatric disorders. Ghanizadeh and colleagues have reported the test-retest reliability of Persian version of this questionnaire to be 0.81 and the inter-rater reliability with 0.69 in which the sensitivity and specificity of Persian version of K-SADS is shown to be high. The K-SADS-PL was used to diagnose ADHD and its psychiatric comorbidities. In the current study, all of the lifespan-related psychiatric diagnoses were considered.

Statistical methods

The obtained data were analyzed by SPSS software version 13. The descriptive statistics (frequency, %, mean, and standard deviation) were used to describe the epidemiologic characteristics and the prevalence of diseases. Chi-square and Fisher exact tests were applied to compare the frequencies. In this study, P-values less than 0.05 were considered significant.

Results

Out of 1658 selected primary school students, 781 (47.1 %) were females and 877 (52.9 %) were males; all aged seven to twelve years. According to CTRS and ADHD-RS, 216 students (13.5 %) were considered for psychiatric interview. Finally, 160 subjects (9.7 %) were diagnosed to have ADHD after interview by a child and adolescent psychiatrist according to DSM-IV-TR. The mean age of ADHD children was 9.26 ± 1.14 years.

The ADHD was more common among boys (n = 95, 12.2 %) compared with girls (n = 65, 7.4 %). The frequencies of ADHD combined type, ADHD inattentive type (ADHD-IA), and ADHD hyperactive/impulsive type (ADHD-HI), were 116 (72.5 %), 29 (18.1 %), and 15 (9.4 %), respectively.

Combined ADHD was more common in boys (n = 74, 63.8 %) than girls (n = 42, 36.2 %). The results revealed that 10 boys (34.5 %) and 19 girls (65.5 %) had ADHD-IA. In addition, 11 male students (73.6 %) and four female ones (26.7 %) were diagnosed as ADHD-HI.

One hundred out of 160 ADHD patients (62.5 %) had a psychiatric comorbidity. According to chi-square test, the frequency was one in 26 children (16.3 %), two in 36 subjects (22.5 %), and three or four comorbid disorders in 38 students (23.8 %) with no sex differences (χ² = 1.91, P < 0.05).

The most common psychiatric comorbidities included oppositional defiant disorder in 47 subjects (29.4 %), specific phobia in 35 children (21.9 %), enuresis in 28 students (17.5 %), and chronic motor tic disorder in 26 subjects (16.3 %). According to the Fisher exact test there was no significant difference on comorbidities between girls and boys (Table 1).

The most common findings in ADHD-HI type were chronic motor tic disorder in five children (33.3 %), oppositional defiant in four students (26.7 %), and specific phobia in four subjects (26.7 %). The most common findings in ADHD-IA type were specific phobia seen in 10 subjects (34.5 %), oppositional defiant in six students (20.7 %), chronic motor tic disorder in five children (17.2 %), and enuresis in five children (17.2 %). The same findings in ADHD- combined type were oppositional defiant in 37 students (31.9 %), enuresis in 22 children (19 %), and specific phobia in 21 subjects (18.1 %).

According to chi-square test the frequency of chronic vocal tic disorder was higher in hyperactive-impulsive type of ADHD compared with other type (χ² = 12.3, P < 0.01).

Discussion

The current study showed that ADHD is a common problem among students in Tabriz, Iran with a prevalence rate of 9.7 % in primary school students with an especially higher rate of ADHD among boys compared with girls (12.2 % versus 7.4 %) which is compatible with another study conducted on an Iranian population. This finding is similar to those reported by Bener, et al. showing a 9.4 % rate for ADHD, but the sex difference was more significant in their study (14.1 % in boys and 4.4 % in girls). Also, in a study in Italy by Mugnaini, et al. ADHD prevalence was reported as 7.1 % with a higher rate in boys than girls (10.4 % versus 1.3 %). In a Nigerian study on 1112 primary school students (six to 12 years old) the prevalence of ADHD was reported to be 7 % – 8 % with a male to female ratio of two to one. Suvarna and Kamath in Nepal reported a total prevalence rate of 12.2 %, male and female prevalence of 19 % and 5.8 %, respectively. Smalley, et al. similarly reported a childhood prevalence of 12.6 %.

Several studies demonstrate a high prevalence of ADHD in primary school children and male predominance with different rates. Nevertheless, factors like as ethnicity, culture, study population, diagnostic tools, and recruitment criteria may account for this discrepancy.

Our results showed that 37.5 % of the patients had no psychiatric comorbidity. In a study by Elia, et al. 33.5 % of patients with ADHD had no psychiatric comorbidity. In addition, a study in Sweden revealed that 23 % of children with ADHD had no psychiatric comorbidity. These variations may be due to selection of cases from different healthy and clinical populations with different exclusion criteria. Many researchers, however, believe that two-third of ADHD patients have psychiatric comorbidity.

Our findings showed that oppositional defiant disorder is the most common disorder in ADHD children (29.4 %) and is common in all types. Hence, oppositional defiant disorder and ADHD
are two related entities. Different studies have shown a high but
various prevalence of oppositional defiant disorder in ADHD. In
Elia, et al.’s study \( ^{10} \) 40 \%, in Souza, et al.’s study \( ^{11} \) 39 \%, and in
Byun, et al.’s study \( ^{12} \) 50.5 \% of ADHD patients were reported to
have oppositional defiant disorder. In most studies such as Kades-
jo and Gilberg’s study \( ^{13} \), the oppositional defiant disorder has been
the most common comorbidity in ADHD children. In studies in
which clinical samples were used, the prevalence was reported to
be high. \( ^{14} \) However, in studies with sample volume selected from
general population the reported prevalence has been lower. Bau-
ermeister, et al. \( ^{8} \) showed this difference with selection of patients
from both general and clinical samples (50.5 \% versus 24.5 \%).
According to our findings the total prevalence of anxiety dis-
orders in ADHD children was 42 \% in which the most common
type was specific phobia. The prevalence of anxiety disorder in
ADHD patients in Rio de Janeiro was 30.8 \% and in Porto Aplege
was 24.2 \%. \( ^{15} \) Bauermeister, et al. \( ^{8} \) reported a rate of 24.43 \% and
31.5 \% in general and clinical samples, respectively. Another study
reported a prevalence rate of 26.5 \% in a cohort study in Finland. \( ^{16} \)
So the anxiety disorder is a common problem in ADHD children
that may affect the treatment of ADHD.

Although it was shown that risks of comorbidity of conduct dis-
order and oppositional defiant disorder are higher among boys
compared with girls in both clinical and general samples, \( ^{17} \) our
study showed no sex difference in the prevalence of any psychiat-
ric comorbidity which are in congruence with a study performed
in Iran. \( ^{18} \) Accordingly, the ADHD is a major problem in girls as
well as boys resulting in disturbance in different functional as-
psects. The comorbidity risk similarity among girls and boys
shows more similarities in other features such as prognosis and
clinical response. Therefore, the question may be arisen whether
ADHD and sex are two independent risk factors for psychiatric
comorbidity in ADHD.

We found that the most common psychiatric comorbidities were
chronic motor tic disorder (33.1 \%), specific phobia (34.5 \%),
and oppositional defiant disorder (31.9 \%) in ADHD- HI type,
ADHD- IA type, and in ADHD- C type, respectively.

Elia, et al. \( ^{10} \) showed that the most common psychiatric comor-
bidities were oppositional defiant disorder (41.9 \%), minor de-
pression and dysthymia (20.8 \%), and oppositional defiant disor-
der (50.7 \%) in ADHD-HI type, ADHD-IA type, and in ADHD-C
type, respectively. Our results were similar to those reported by
Elia, et al. \( ^{10} \) and Byun, et al. \( ^{11} \) about higher frequency of oppo-
sitional defiant disorder in ADHD-C type. However, in the other
subtypes the results were not similar that may be due to differ-
ence in study methods and selection of the subjects from general
population or clinic attending subjects. We also evaluated bipolar
comorbidity in ADHD subjects through the study but the results
showed that there was no comorbidity like a UK sample of chil-
dren with ADHD. \( ^{14} \) The ones that reported ADHD-BMD comor-
bidities mostly have done research on the adolescent populations.
It seems that children manifest more bipolarity with growing up
to the adolescence.

High prevalence of ADHD and also psychiatric comorbidities
among ADHD subjects recall the need to treatment and multi-di-
ensional interventions. Also, increasing the knowledge level of
families may be effective in treatment of this disorder especially
the oppositional defiant disorder that may develop numerous
problems in communicative function of students. Like all studies,
ours has limitations that must be considered, including ascertain-

The prevalence of ADHD was 9.7 \% (160 subjects). The fre-
quency of ADHD was higher in boys.

Sixty-two point five percent of primary school students with
ADHD had psychiatric comorbidity. Oppositional defiant disorder
(29.4 \%), specific phobia (21.9 \%), enuresis (17.5 \%), and chronic
motor tic disorder (16.3 \%) were the most common psychiatric
comorbidities in ADHD children. Chronic motor tic disorder, op-
opositional defiant disorder, and specific phobia were related to
hyperactive-impulsive type, combined type, and inattentive type
of ADHD, respectively that recall the need to specific attention
in treatment. Age variant plays an important role in determining
the prevalence of a psychiatric disorder. In our study, the target
population was limited to the students of primary schools. Also,
hibition of students’ behaviors due to school orders may affect
on the teachers’ assessments so that only severe cases could attract
their attentions. For the next studies, parents’ assessment at homes
is suggested.

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